CLAIMS

1. A method to cold-start a fuel cell system at sub-zero temperatures, the fuel cell system having a fuel cell stack upstream of which is connected a heating device to heat a cooling agent to be circulated by a coolant pump, comprising the following steps:

operating the fuel cell stack at an output power in such a way that the generated power is adequate to operate the heating device and the coolant pump;

using the power provided by the fuel cell stack to operate the heating device for the heating of the cooling agent as well as the coolant pump, and circulating the cooling agent between the fuel cell stack and the heating device; and

shutting off the heating device when the fuel cell stack has reached a preset temperature that is higher than the original temperature.

2. The method of claim 1 wherein the preset temperature is at least 0 degrees Celsius.

3. The method of claim 1 wherein the preset temperature is at least +5 degrees Celsius.

4. The method of any one of claims 1 to 3 wherein the fuel cell stack is operated until the preset temperature has been reached, at a capacity that does not exceed 10% of the nominal output power of the fuel cell system.

5. The method of any one of claims 1 to 4 wherein the heating device is a burner.

6. The method of claim 5 wherein, to operate the burner, power is provided from the fuel cell stack to the auxiliaries necessary for the operation of the burner.

7. The method of any one of claims 5 or 6 wherein the burner is operated with hydrogen.

8. The method of any one of claims 5 to 7 wherein one and the same air compressor is used to supply oxygen to the fuel cell stack and to the burner.

9. The method of any one of claims 5 to 8 wherein the burner is a high-performance gas burner.

10. The method of any one of claims 8 or 9 wherein the air volume provided by the air compressor is divided between the burner and the fuel cell stack with a ratio that favours the burner.

11. The method of claim 10 wherein the air volume provided by the air compressor is divided between the burner and the fuel cell stack with a 4:1 ratio.

12. The method of any one of claims 1 to 11 wherein the fuel cell stack is a solid-polymer-electrolyte fuel cell stack.

13. The method of any one of claims 1 to 12 wherein the fuel cell system is equipped with a starter battery.

14. The method of claim 13 wherein the starter battery is dimensioned to supply electrical power to the auxiliaries necessary for the supply of reactants to the fuel cell stack until the fuel cell stack itself generates electrical power.

15. The method of any one of claims 13 or 14 wherein in a first stage the starter battery initially supplies power to the auxiliaries necessary for the supply of reactants to the fuel cell stack, and wherein this initial power feed is interrupted when the fuel cell stack generates electrical power.